

**Citation:**

Thompson OM, Ballew C, Resnicow K, Must A, Bandini LG, Cyr H, Dietz WH. Food purchased away from home as a predictor of change in BMI z-score among girls. *Int J Obes Relat Metab Disord*. 2004 Feb; 28 (2): 282-289.

**PubMed ID:** [1467177](#)

**Study Design:**

Prospective Cohort Study

**Class:**

B - [Click here](#) for explanation of classification scheme.

**Research Design and Implementation Rating:**

POSITIVE: See Research Design and Implementation Criteria Checklist below.

**Research Purpose:**

To assess the relationship between eating food purchased away from home (FAH) and longitudinal change in body mass index (BMI) z-score among girls and to assess the longitudinal tracking of eating FAH from childhood through adolescence.

**Inclusion Criteria:**

- Pre-menarchal at time of enrollment
- Triceps skinfold thickness below the 85th percentile by age and sex
- In good health
- Provided two complete dietary records separated by at least one year.

**Exclusion Criteria:**

Not described.

**Description of Study Protocol:****Recruitment**

- Participants were recruited from Cambridge, MA and Somerville, MA and an MIT-sponsored summer day camp
- Participants friends and siblings were also invited to enroll
- Recruitment took place in 1990.

**Design**

Prospective cohort study.

## **Dietary Intake/Dietary Assessment Methodology**

Seven-day food records.

### **Blinding Used**

None reported.

### **Intervention**

Not applicable.

### **Statistical Analysis**

- Analysis of variance adjust for unbalanced cell size was used to assess the relationship between change in BMI z-score and frequency of eating FAH, or percent of energy derived from eating FAH
- Covariates included: Elapsed time between baseline and follow-up, physical activity, age at baseline and follow-up, baseline BMI z-score, ethnicity, parental BMI, income and education. Baseline BMI z-score was significantly associated with change in BMI z-score and was therefore included in the models. None of the other covariates were significantly associated with change in BMI z-score and were therefore not included in either model
- The kappa coefficient was used to assess the measure of tracking of eating FAH from childhood through adolescence.

## **Data Collection Summary:**

### **Timing of Measurements**

- Baseline measurements were taken in 1990
- Participants were included in this study if they provided at least one additional complete dietary record at least one-year after baseline, with a maximum follow-up length of up to 10 years
- The follow-up time varied because girls exited the study four years after menarche
- The median follow-up time was six years, with a range of two to 10 years.

### **Dependent Variables**

Body mass index (BMI) z-score was the primary outcome measure. BMI was calculated based on measured heights and weights taken by study personnel.

### **Independent Variables**

- Food consumed away from home
  - Quick-service food: From a national quick-service food outlet or from local submarine (sandwich) shops, ice cream parlors and street vendors
  - Coffee-shop food: From a coffee shop or doughnut shop
  - Restaurant food: Came from a pizza parlor, a self-service restaurant, or a wait-staff restaurant
- For each category of FAH, the number of occasions per week was determined and the categories were:
  - Never ate FAH
  - Ate FAH once a week

- Ate FAH twice a week or more
- For each category of FAH, the percent of weekly energy intake derived from each category of FAH relative total weekly energy intake was determined and the categories were:
  - Did not eat FAH
  - Obtain 0.1-5.9% of their energy intake from FAH
  - Obtain 6% or more of their energy intake from FAH.

### Control Variables

- Ethnicity
- Age at baseline
- Age at follow-up
- Physical activity level
- Annual household income
- Parents' education
- Parents' height and weight
- Baseline BMI z-score.

### Description of Actual Data Sample:

- *Initial N*: 196 girls who completed the original study
- *Attrition (final N)*: 101 who completed baseline and follow-up dietary records
- Age:
  - Baseline: Median age was nine years, with a range of eight to 12 years
  - Follow-up: Median age was 15 years, with a range of 11-19 years
- *Ethnicity*: 74% were white
- *Other relevant demographics*
  - 60% came from families earning at least \$50,000 annually
  - Most of the mothers and father had at least college-level education (72% and 81%, respectively).
- *Anthropometrics*
  - Baseline BMI was less than the 85th percentile for 96% of participants, with 4% at or above the 85th percentile
  - Baseline BMI=16.4kg/m<sup>2</sup> (range 12.9-21.6kg/m<sup>2</sup>)
  - Follow-up BMI=20.3kg/m<sup>2</sup> (range 13.8-30.4kg/m<sup>2</sup>).
- *Location*: United States.

### Summary of Results:

#### FAH Consumption

- At baseline, 71% of participants ate FAH, and at follow-up this increased to 86% with the median number of total FAH occasions increased from two to three times per week
- Most participants ate FAH once or twice a week (61%), by some were eating FAH as much as five times per week at baseline, and even more frequently at follow-up (up to 11 times per week)
- Most of the FAH was from restaurants and quick-service outlets and not from coffee shops.

#### FAH and BMI z-score

- Weekly frequency of consuming quick-service food at baseline was positively associated with change in BMI z-score ( $F=3.37$ ,  $P<0.05$ ), but the frequency of eating in coffee shops and restaurants at baseline was not
- The relationship between baseline frequency of quick-service food consumption and change in BMI z-score was strengthened after adjusting for baseline BMI z-score ( $F=6.49$ ,  $P<0.01$ )
- Participants who ate quick-service food twice a week or more at baseline had the greatest mean change in BMI z-score at follow-up, and this change was significantly different from that seen in girls who ate quick-service food once a week or not at all ( $P<0.05$ )
- There was not a statistically significant relationship between baseline quick-service food consumption and baseline energy intake
- There was no relationship between change in BMI z-score and the percent of weekly energy intake from each category of FAH.

### Author Conclusion:

Adolescent girls who eat quick-service food twice a week or more are likely to increase their relative BMI over time.

### Reviewer Comments:

*The generalizability of these findings are limited due to the fact that most participants were middle- to upper-class white girls, who reported being more physically active than their peers.*

### Research Design and Implementation Criteria Checklist: Primary Research

#### Relevance Questions

- |    |   |     |
|----|---|-----|
| 1. | Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies) | N/A |
| 2. | Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?   | N/A |
| 3. | Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?  | N/A |
| 4. | Is the intervention or procedure feasible? (NA for some epidemiological studies)  | N/A |

#### Validity Questions

- |      |   |     |
|------|---|-----|
| 1.   | <b>Was the research question clearly stated?</b>  | Yes |
| 1.1. | Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified? | Yes |

1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
<b>2.</b>	<b>Was the selection of study subjects/patients free from bias?</b>	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
<b>3.</b>	<b>Were study groups comparable?</b>	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
<b>4.</b>	<b>Was method of handling withdrawals described?</b>	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes

4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
<b>5.</b>	<b>Was blinding used to prevent introduction of bias?</b>	<b>Yes</b>
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
<b>6.</b>	<b>Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?</b>	<b>Yes</b>
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	Yes
6.6.	Were extra or unplanned treatments described?	Yes
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
<b>7.</b>	<b>Were outcomes clearly defined and the measurements valid and reliable?</b>	<b>Yes</b>
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes

7.5.	Was the measurement of effect at an appropriate level of precision?	???
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
<b>8.</b>	<b>Was the statistical analysis appropriate for the study design and type of outcome indicators?</b>	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	Yes
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
<b>9.</b>	<b>Are conclusions supported by results with biases and limitations taken into consideration?</b>	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
<b>10.</b>	<b>Is bias due to study's funding or sponsorship unlikely?</b>	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes